



## UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/761,753	01/18/2001	Yukimasa Ishida	980307A	8695
23850	7590	11/18/2003	EXAMINER TOLEDO, FERNANDO L	
ARMSTRONG, KRATZ, QUINTOS, HANSON & BROOKS, LLP 1725 K STREET, NW SUITE 1000 WASHINGTON, DC 20006			ART UNIT 2823	PAPER NUMBER

DATE MAILED: 11/18/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/761,753

Applicant(s)

ISHIDA ET AL.

Examiner

Fernando Toledo

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 23 July 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-6, 8, 9 and 22-38 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 22-30 is/are allowed.
- 6) ☒ Claim(s) 1-3, 5, 6 and 31-38 is/are rejected.
- 7) ☒ Claim(s) 4 and 9 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 18 January 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. §§ 119 and 120

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☒ Certified copies of the priority documents have been received in Application No. 09/041,674.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1 – 3, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al. (U. S. patent 6,338,991 B1) in view of Noumi et al. (U. S. patent 5,915,172 A).

In re claim 1, Zhang in the U. S. patent 6,338,991 B1; figures 1A – 11D and related text, discloses forming a conducting layer 7 composed of an anodically oxidizable metal on a substrate; etching the conducting layer to form several of bus lines having upper surface parallel to the substrate and connection portion electrically connected to the bus lines and having upper surface parallel to the substrate; anodically oxidizing the bus lines and the connection portion so that the bus lines and the connection portions include inner conducting portions and outer insulating oxide films covering the inner conducting portion respectively (Column 13).

Zhang does not show wherein the bus line and conducting portion's sides are inclined or outwardly protruding.

However, Noumi in the U. S. patent 5,915,172 A1; figures 1A – 6D and related text, discloses wherein the bus line and conducting portion's sides are inclined or outwardly protruding to improved the coatability of the etched films (Figure 4).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the bus lines and connection portions of Zhang with inclined or tapered sides or outwardly protruding because according to Naumi, the tapered or inclined sides of the bus lines and connection portion improve the coating of the etched films.

3. In re claims 2 and 3, Zhang in view of Noumi does not disclose wherein the etching step is carried out so that the side surfaces of the bus lines and the side surfaces of the connection portions are inclined at angles within the range from 20° to 60° (30° to 50°) on average with respect to the substrate.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the inclined surfaces at angles within the range from 20° to 60° (30° to 50°), since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233. In addition, the selection of angle of inclination, is obvious because it is a matter of determining optimum process conditions by routine experimentation with a limited number of species of result effective variables. These claims are prima facie obvious without showing that the claimed ranges achieve unexpected results relative to the prior art range. In re Woodruff, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also In re Huang, 40 USPQ2d 1685, 1688 (Fed. Cir. 1996)(claimed ranges or a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also In re Boesch, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill or art) and In re Aller, 105 USPQ 233 (CCPA 1995) (selection of optimum ranges within prior art general conditions is obvious). Note that the

specification contains no disclosure of either the critical nature of the claimed angles of inclination or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen angles of inclination or upon another variable recited in a claim, the Applicant must show that the chosen angles of inclination are critical. *In re Woodruf*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

4. In re claim 8, Zhang in view of Noumi shows wherein the etching step is carried out so that the angles between the upper surfaces and the side surfaces of the bus lines and of the connection portion are obtuse angles (Figure 4 of Noumi).

5. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang and Naumi as applied to claims 1 – 3 and 8 above, and further in view of Wolf and Tauber (Silicon Processing for the VLSI Era Volume 1: Process Technology, pp 452 – 453).

Zhang in view of Naumi do not teach wherein a resist mask is post-baked at a temperature of 115°C, prior to forming the gate electrodes.

However, Wolf and Tauber in the textbook “Silicon Processing for the VLSI Era Volume 1: Process Technology”, pp 452 – 453 discloses as conventional in the art to post bake a photoresist prior to etching the layers below at a temperature not lower than 130°C but not higher than 200°C.

Therefore, It would have been obvious to one having ordinary skill in the art at the time the invention was made to post-bake the photoresist of Zhang in view of Naumi prior to etching the gate electrodes to a temperature of a 115°C as taught by Wolf and Tauber as it is the conventional way to prepare a photo resist prior to etching the layers below it.

6. Claims 31 - 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al. in view of Noumi.

In re claim 31, Zhang discloses forming a semiconductor layer having a predetermined shape on a substrate 21a and 21b; forming an insulating film on the substrate to cover the semiconductor layer 22; forming a conducting layer composed of an anodically oxidizable metal on the substrate in such shape as to cover a portion of the semiconductor layer and to form gate electrodes having an upper surface parallel to the substrate (figure 4A); anodically oxidizing the gate electrode (column 13); forming the insulating film into a predetermined shape using the gate electrodes including the anodically oxidized film as a mask (figure 4C); injecting impurities into the semiconductor layer using the gate electrodes including the anodically oxidized film and the insulating film as a mask to form an offset in the semiconductor layer (column 13).

Zhang does not teach wherein the bus lines and connection portions have inclined sides.

However, Noumi discloses also forming a thin film transistor (TFT) wherein the bus lines and connection portion have tapered or inclined sides to improve the coatability of the etched films (figure 4).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the bus lines and connection portions of Zhang with inclined or tapered sides because according to Naumi, the tapered or inclined sides of the bus lines and connection portion improve the coating of the etched films.

7. In re claim 32, Zhang teaches wherein the thin-film device is a substrate including thin-film transistor (figure 4C).

8. In re claim 33, Zhang teaches wherein the anodically oxidizable metal includes at least one of Al, Ta, Al-Si, Al-Ta, Al-Zr, Al-Nd, Al-Pd, Al-W, Al-Ti, Al-Ti-B, Al-Sc, Al-Y, Al-Pt and Al-Pa (column 13).

9. In re claim 34, Zhang teaches wherein the anodically oxidized film is a barrier-type anodically oxidized film (column 13).

10. In re claim 35, Zhang teaches wherein the semiconductor layer includes polycrystalline silicon (column 12).

11. In re claim 36, Zhang teaches wherein an initial current density at the time of executing the anodic oxidation is not smaller than  $2.0 \text{ mA/cm}^2$  but is not larger than  $3.0 \text{ mA/cm}^2$  (column 13).

12. Claim 37 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang in view of Naumi as applied to claims 31 – 36 above, and further in view of Bae et al. (U. S. patent 5,202,274).

Zhang does not disclose wherein the etching is either ionic milling or dry-etching.

Naumi discloses forming tapered or inclined electrodes using a wet etch composition.

However, Zhang in view of Naumi does not teach wherein the etching is either ionic milling or dry-etching.

Bac discloses forming tapered or inclined electrodes using a dry etch composition (column 3).

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the gate electrodes of Zhang by dry-etching as taught by Bac instead of wet etching since one of ordinary skill in the art will realize that dry etching and wet

etching the gate electrodes for the disclose intended purposes are art recognized equivalents. Also, choosing a well-known etching technique on the basis of its suitability requires only ordinary skill in the art.

13. Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang and Naumi as applied to claims 31 – 35 above, and further in view of Wolf and Tauber (Silicon Processing for the VLSI Era Volume 1: Process Technology, pp 452 – 453).

Zhang in view of Naumi do not teach wherein a resist mask is post-baked at a temperature not lower than 130°C but not higher than 200°C, prior to forming the gate electrodes.

However, Wolf and Tauber in the textbook “Silicon Processing for the VLSI Era Volume 1: Process Technology”, pp 452 – 453 discloses as conventional in the art to post bake a photoresist prior to etching the layers below at a temperature not lower than 130°C but not higher than 200°C.

Therefore, It would have been obvious to one having ordinary skill in the art at the time the invention was made to post-bake the photoresist of Zhang in view of Naumi prior to etching the gate electrodes to a temperature of 130°C but not higher than 200°C as taught by Wolf and Tauber as it is the conventional way to prepare a photo resist prior to etching the layers below it.

#### ***Allowable Subject Matter***

14. Claims 22 – 30 are allowed over the prior art of record.

15. Claims 4 and 9 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.



***Response to Arguments***

16. Applicant's arguments filed 23 July 2003 have been fully considered but they are not persuasive for the following reasons.

Applicant contests, regarding the rejection of claims 31 - 36, the following:

"[T]he Examiner has ignored the rest of the sentence of Noumi et al., which completely changes the context of the sentence. The sentence of Noumi et al. continues by stating 'by investigating the composition of the phosphoric acid, acetic acid and nitric acid profile in advance.' Thus, Noumi et al. clearly teaches that the coatability is not improved by a tapered profile, but by investigating the composition of phosphoric acid, acetic acid and nitric acid. This meaning is further clarified in Noumi et al.'s use of the term 'the' in the phrase 'the tapered profile' as opposed to referring to a tapered profile."

Examiner respectfully submits the following:

In this event, for patterning the Al film, an etchant primarily composed of phosphoric acid, acetic acid, and nitric acid is used, but the coatability relating to the film formed on the top surface can be improved by forming the etched end surface of the Al film in the tapered profile by investigating the composition of phosphoric acid, acetic acid, and nitric acid. (Column 4, Lines 53 - 57 of Noumi et al.).

The coatability of the Al film is not improved by the etchants but by the tapered profile of the patterned Al film, what is affected by the etchant is the tapered profile of the Al film. Hence, Noumi does teach that the coatability of the Al film is improved by the tapered profile of the film.

***Conclusion***

17. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after

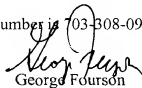
the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Fernando Toledo whose telephone number is 703-305-0567. The examiner can normally be reached on Mon-Fri 8am to 4pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone number for the organization where this application or proceeding is assigned is 703-308-7382.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

  
FToledo

  
George Fourson  
Primary Examiner  
Art Unit 2823